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CLAIM + DETAILED DESCRIPTION

[Claim(s)]

[Claim 1] In the battery by which it comes to accommodate an electrode and an electrolyte substance in the battery exterior cases which consist of a multilayer film with which the weld nature resin layer was covered by both sides of the conductive board The battery characterized by connecting with a conductive board by thermal melting arrival of the lead part being carried out, and connecting the electrode to each of the inner side of the above-mentioned battery exterior cases, and an outside at the inside lead part.

[Claim 2] The battery according to claim 1 characterized by a lead part being a metal network.

[Claim 3] The battery according to claim 1 characterized by equipping an electrode with a current collection object and connecting the lead part inside battery exterior cases to this current collection object.

[Claim 4] The battery according to claim 3 characterized by the current collection object of an electrode being a metal network.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a battery suitable as a power supply of thin electron devices, such as an IC card.

[0002]

[Description of the Prior Art] For example, in an IC card, in order to hold the accumulated information, a power supply is built in in the main part of a card. As a power supply built in this IC card, it is required to satisfy the following requirements.

[0003] First, in the IC card, standards, such as JIS, are established about the size and to be molded by total thickness very thinly with 800 micrometers or less is demanded. Therefore, it is

called for that the battery built in this is also molded as thinly as possible.

[0004] Furthermore, to excel in pliability structurally is demanded so that the IC card can bear a certain amount of stress on the use. So, it is required for the battery built in too to also have pliability.

[0005] As a power supply built in an IC card, the monotonous type battery which put ****, the separator, the plus terminal, and the electrolyte substance between a pair of tabular battery exterior cases is used.

[0006] By this monotonous type battery, although metal plates, such as stainless steel, are considered as battery exterior cases, in using for an IC card, it becomes requirements like **** to have pliability. For this reason, to use the multilayer film reinforced with pliability covering high polymer films, such as high polyolefin, as battery exterior cases for both sides of very thin thickness and the made metal plate is tried.

[0007] Since closure of a battery can perform [heating weld] while pliability is given to a battery if these exterior cases are used, a manufacturing process facilitates and it becomes very advantageous also in productivity. moreover, [especially the fuel cell subsystem that dislikes contact with moisture and that uses lithium metal etc. for an electrode] If a dampproof high high polymer film is chosen, it will also become possible to aim at improvement in weatherability (Applications of Electroactive polymers, Eds.by B.Scrosati, Chapman and Hall, 1993). In addition, as such a multilayer film, what stuck the polyamide film or the polyethylene film on the aluminum plate is marketed as a general-purpose article.

[0008]

[Problem to be solved by the invention] By the way, when using the above-mentioned multilayer film as battery exterior cases, if it remains as it is, the current from an electrode cannot be taken out from being covered with the high polymer film which is an insulation material outside. That is, it is required by using a certain lead means to prepare an electrode and the external terminal which flowed.

[0009] About how to take out such an external terminal, as shown in drawing 6 , the leads 63A and 63C are attached to **** 61 and a plus terminal 62, and the method of making cross the thermal melting arrival part of the battery exterior cases 64A and 64C, and taking out these leads 63A and 63C as an external terminal is proposed.

[0010] However, if it does in this way and a lead is taken out outside, in the portion which takes out this lead, the adhesion intensity of battery exterior cases will become weak. For this reason, when external stress is added to a battery, there is a problem that the sealing nature of a battery is spoiled from this portion.

[0011] Then, this invention is proposed in view of such the conventional actual condition, and while excelling in pliability and dampproofing, even when external stress is added, sealing nature aims at offering the battery held highly.

[0012]

[Means for solving problem] In order to attain the above-mentioned purpose, [the battery of this invention] It connects with a conductive board by coming to accommodate an electrode and an electrolyte substance in the battery exterior cases which consist of a multilayer film with which the weld nature resin layer was covered by both sides of the conductive board, and thermal melting arrival of the lead member being carried out to the inner side and outside of the above-mentioned battery exterior cases, an electrode is further connected to an inside lead member, and it is constituted.

[0013]

[Mode for carrying out the invention] It explains referring to Drawings about the form of operation of this invention.

[0014] The concrete form of the battery of this invention is shown in drawing 1 .

[0015] This battery has become because **** 1, the electrolyte substance 2, a separator 3, the electrolyte substance 4, and a plus terminal 5 put the electrode structure which this order comes to laminate with a pair of tabular battery exterior cases 7A and 7C and carry out thermal melting arrival of the rim part of these battery exterior cases 7A and 7C.

[0016] An above-mentioned pair of battery exterior cases 7A and 7C have a micron unit, very thin thickness, and multilayer film structure with which thermal melting arrival nature resin 9A and 9C was covered by both sides of Boards (conductive board) 8A and 8C which have the made conductivity, and the battery is closed by thermal melting arrival of the rim part being carried out mutually.

[0017] and [the inner side and outside of an above-mentioned pair of battery exterior cases 7A and 7C] The lead parts 10A and 10C by which were connected with the conductive boards 8A and 8C by thermal melting arrival of the lead parts 10A, 10C, 11A, and 11C being carried out, respectively, among these thermal melting arrival was carried out inside the battery exterior cases 7A and 7C touch **** 1 or a plus terminal 5.

[0018] Therefore, by this battery, the inner side lead part 10A by the side of **** 1 and ****, the conductive board 8A, and the outside lead part 11A flow, and the inner side lead part 10C by the side of a plus terminal 5 and a plus terminal, the conductive board 8C, and the outside lead part 11C flow. That is, the outside lead part 11A by the side of **** and the outside lead part 11C by the side of a plus terminal will function as the external terminal of ****, and an external terminal of a plus terminal, respectively, and receipts and payments of current will be made from this terminal.

[0019] Thus, by the battery in which an external terminal is formed, the adhesion state of battery exterior cases becomes uniform compared with the battery by which a lead part makes the thermal melting arrival part of battery exterior cases cross, and is taken out by thermal melting arrival of the inner side lead parts 10A and 10C and the outside lead parts 11A and

11C being carried out to the battery exterior cases 7A and 7C. Therefore, even when external stress is added to a battery, exfoliation does not arise in the thermal melting arrival part of battery exterior cases, and an altitude is held for the sealing nature of a battery. For this reason, operation stability is acquired, long-term preservation is possible and reliability can be secured.

[0020] The assembly of such a battery is performed at the process shown in drawing 2 (a), (b), and drawing 3 (a) - (c).

[0021] First, as shown in drawing 2 (a) and (b), thermal melting arrival of the inner side lead parts 10A and 10C and the outside lead parts 11A and 11C is carried out to the battery exterior cases 7A and 7C at the heating heater, putting moderate pressure. The inner side lead parts 10A and 10C and the outside lead parts 11A and 11C are contacted and fixed to the conductive boards 8A and 8C by this thermal melting arrival, and will be flowed by the inner side lead parts 10A and 10C and the outside lead parts 11A and 11C through the conductive boards 8A and 8C.

[0022] In addition, here [the weld position of the inner side lead parts 10A and 10C and the outside lead parts 11A and 11C] It is not necessary to make it not necessarily in agreement, and the inner side lead parts 10A and 10C may weld the outside lead parts 11A and 11C to a position which contacts **** or a plus terminal in a suitable position again according to the use.

[0023] And in this way, between a pair of battery exterior cases with which thermal melting arrival of the lead parts 10A, 10C, 11A, and 11C was carried out, as are shown in drawing 3 (a), and **** 1, a separator 3, and a plus terminal 5 are put and it is further shown in drawing 3 (b), the electrolyte substance 4 is added and these battery member is piled up. Thermal melting arrival is carried out in this state, putting [to be shown in drawing 3 (c)] moderate pressure on the rim part of the battery exterior cases 7A and 7C, and a battery is assembled.

[0024] The following are used as a material of each constituent factor of such a battery.

[0025] First, as conductive boards 8A and 8C, the metal which has a light weight and pliability is used, for example, the above-mentioned battery exterior cases 7A and 7C have advantageous aluminum foil from the field of cost, although thermal melting arrival nature resin 9A and 9C is covered and constituted by both sides of the conductive boards 8A and 8C. Moreover, what can give intensity to the very thin conductive board of thickness, and can carry out thermal melting arrival of the lead part with the technique of the usual thermal melting arrival as thermal melting arrival nature resin 9A and 9C is chosen. Polyamide resin, such as polyolefin system resin, such as polyethylene and polypropylene, and nylon, acetic acid vinyl system resin, acrylic resin, epoxy system resin, etc. are desirable among the thermal melting arrival resin made well-known as such resin until now. In addition, among this enumerated resin, it is low, and gas permeability is excellent also in chemical resistance, and suitable for polyethylene resin and polypropylene resin as battery exterior cases. On the other hand

especially in respect of mechanical intensity, nylon resin is excellent.

[0026] If it has flow nature, material and form in particular will not be limited for the lead parts 10A, 10C, 11A, and 11C which carry out thermal melting arrival to the battery exterior cases 7A and 7C. In addition, when the rate of specific resistance is taken into consideration, metallic foil, such as copper, aluminum, nickel, iron, and stainless steel, is desirable, and since it is easy to paste up with weld nature resin, it is good [the form] that it is a mesh-like.

[0027] About **** 1, a plus terminal 5, a separator 3, and the electrolyte substance 4, each thing conventionally used by the well-known fuel cell subsystem can adopt. Since selection of the thermal melting arrival nature resin used for battery exterior cases can give dampproofing to a battery if this invention is especially applied to the lithium battery system using lithium metal as an active material of ****, there is an effect also in an improvement of weatherability.

[0028] However, since it is dealt with on the occasion of a battery assembly as an electrolyte substance 4, and a sex is good and worries about a liquid spill do not have it, either, it is desirable to use the electrolyte of a solid or the shape of gel. For example, in a lithium battery, the gel electrolyte which added polyacrylonitrile to composition of nonaqueous electrolyte as gelling material can be used.

[0029] Moreover, when the conductivity of an electrode active material is low, you may make an electrode possess a current collection object. In this case, a current collection object is arranged on the exterior-cases side, and is considered as the composition that this current collection object contacts an inner side lead. In addition, as this current collection object, a metal mesh is suitable.

[0030]

[Working example] The work example of this invention is explained based on an experimental result.

[0031] a work example 1 -- battery exterior cases were produced as follows first.

[0032] By carrying out thermal melting arrival of the 30-micrometer-thick polyethylene film to both sides of 40-micrometer-thick aluminum foil, 3 layer-membrane film with an overall thickness of 100 micrometers was produced, and it judged in 4x4cm size two.

[0033] And a place is coincided with both sides of the battery exterior cases produced by doing in this way, and thermal melting arrival of an inner side lead part and the outside lead part was carried out, applying pressure with a heat pulse method. This inner side lead part and an outside lead part are the meshes made from stainless steel with a size of 0.5x0.5cm², and a thickness of 30 micrometers (SUS304), and thermal melting arrival was carried out to the position distant from the center of battery exterior cases 1cm in the direction of one side so that it might become parallel to two sides. In addition, on the occasion of this thermal melting arrival, the tester investigated the situation of the flow of an inner side lead part and an outside lead part, and when a flow was inadequate, thermal melting arrival operation was repeated.

[0034] Next, the plus terminal was produced as follows.

[0035] Plus terminal medical mixture slurry was prepared by distributing JIMECHIRUHORUMI amide (DMF) for a powdered manganese dioxide 90 weight part, a powdered polyvinylidene fluoride 3 weight part, and a powdered black lead 7 weight part as a solvent. Subsequently, this plus terminal medical mixture slurry was applied to the aluminum mesh used as a current collection object, and decompression dryness was carried out at the temperature of 100 degrees C for 24 hours. Then, the plus terminal was produced by compressing into 130 micrometers in thickness the plus terminal binder layer formed on this current collection object, and starting it in 2x2cm a size two by carrying out a roll press by suitable pressure. And spot welding of the current collection object side of this plus terminal was carried out at the inner side lead part of battery exterior cases.

[0036] Next, it produced by cutting down Li metal in 2x2cm a size two, and compressing **** into 130 micrometers. And this **** was made to stick to the inner side lead part of battery exterior cases different from having welded the plus terminal by pressure.

[0037] On the other hand as an electrolyte substance, the gel-like electrolyte (PAN:EC:PC: perchloric acid lithium (molar ratio) =13:55:27:5) which consists of polyacrylonitrile (PAN), ethylene carbonate (EC), propylene carbonate (PC), and perchloric acid lithium was used. In addition, this gel-like electrolyte was formed as follows.

[0038] After EC and PC of the specified quantity added perchloric acid lithium of the specified quantity in the beaker by which mixed stirring was carried out, this was heated to 100 degrees C. And when heated enough, a little PAN(s) of the specified quantity were added every, and heating stirring was carried out for 10 minutes after the end of addition. As a result, PAN dissolves completely and ***** solution is obtained. The gel-like electrolyte was formed by ending heating at this time and carrying out adequate amount flow casting of the obtained solution on a plus terminal immediately. Moreover, the gel-like electrolyte was formed also like negative best quality.

[0039] After piling up the plus terminal in which the gel-like electrolyte was formed as mentioned above, and **** through a polypropylene nonwoven fabric with a thickness [used as a separator] of 50 micrometers, the battery was closed by carrying out heating weld of the rim part of battery exterior cases, and the thin battery was produced.

[0040] Thermal melting arrival of an inner side lead part and the outside lead part was not carried out to comparative example 1 battery exterior cases, but as shown in drawing 6 , the thin battery was produced like the work example 1 except having crossed the thermal melting arrival part of battery exterior cases, and having taken out the lead part outside.

[0041] About the battery produced as mentioned above, in order to verify airtightness, the bending examination was done and the electric discharge examination was done after that.

[0042] In addition, as shown in drawing 4 , it fixed by facing across the central part of the

battery 12 with a pair of square lumber 13 of 8cm of 0.5cm[in width] x passages, and the bending examination was done under normal temperature **** by repeating operation of making battery both ends going up and down perpendicularly 1.0cm to a plane, respectively, 300 times.

[0043] Moreover, the electric discharge examination was done by discharging the battery which did the bending examination under normal temperature ****, after neglecting it for 24 hours until closed circuit voltage amounts to 1.8V in the constant current of 500microA. Electric discharge capacity was estimated from voltage change in this electric discharge process. The relation between electric discharge time and battery voltage is shown in drawing 5 .

[0044] Compared with the battery of the work example 1 which carried out thermal melting arrival of the lead part to battery exterior cases, voltage begins to fall at an early stage, and, as for the battery of the comparative example 1 which took out the lead from the thermal melting arrival part of battery exterior cases, sufficient electric discharge capacity is not obtained so that clearly from drawing 5 . This is because sealing nature became low and this caused performance degradation by bending examination by the battery of the comparative example 1.

[0045] Furthermore, when both batteries were disassembled after the examination and the inside was observed, inside the battery of a comparative example 1, the white granular material which belongs to lithium hydroxide was observed in large quantities. On the other hand, lithium metal was maintained by the battery of the work example 1 by the state of being glossy.

[0046] It turned out that it is effective in obtaining the high battery of sealing nature which bears external stress to form the external terminal of a battery from the above result by carrying out thermal melting arrival of the lead part to battery exterior cases.

[0047]

[Effect of the Invention] So that clearly also from the above explanation [the battery of this invention] Since the external terminal is formed by coming to accommodate an electrode and an electrolyte substance in the battery exterior cases with which both sides of a conductive board come to cover a weld nature resin layer, and thermal melting arrival of the lead member being carried out to each of the inner side of the above-mentioned battery exterior cases, and an outside While pliability and dampproofing are acquired, even when external stress is added to a battery, sealing nature is held highly. Therefore, it is very suitable as a power supply of the IC card to which external stress may be added.

[Translation done.]